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seam

Partner Spotlight:
Cambridge Collaborative

Principle Scientist at Cambridge Collaborative, Patricia Manning, discusses some interesting topics relating to the NVH tool, SEAM.

APA: Why or how was Cambridge Collaborative founded? What opportunities were there in the market?

Patricia: Cambridge Collaborative was founded in 1971 to provide engineering R&D services in the area of acoustics and vibrations. At that time gaining an understanding of the interaction between structures and acoustics was an important research topic for a broad range of applications. Early projects involved studies of ship radiated noise, aircraft cabin noise, helicopter gearbox noise, space vehicle vibration response to launch acoustics, and construction vehicle cab noise. In these projects computer modeling was just coming into use. CC began using Statistical Energy Analysis since this analysis method was uniquely qualified for the high frequencies at which acoustics are important.

In 1980 CC wrote the SEAM software code to provide greater help in developing models to predict structure-borne noise. CC customers were interested in using SEAM to help with their design studies. From these early requests the first commercial SEA software product, SEAM, was developed and sold by Cambridge Collaborative. SEAM use spread into the automotive and large equipment industries in the early eighties when product noise became an important consumer concern. Other commercial SEA software products were soon introduced so that today, SEA models are used worldwide to study vibration and acoustics. SEAM continues to be used in commercial and government industries to make quiet products with the most cost effective sound treatments.

APA: What are some benefits of using SEAM for NVH Analysis?

Patricia: SEAM provides acoustical engineers with a modeling tool that provides acoustic and vibration predictions very early in the design phase of a product. Although the accuracy of these early predictions is limited, they provide engineers with useful information regarding expected acoustic and vibration response levels, the relative importance of different sources, and the paths by which vibrational and acoustic energy is transmitted throughout the dynamic system being studied. By having this information early in the design, engineers can begin design modifications that will solve the acoustic problems before it is too late. The strength of SEAM lies in the efficiency of model development, run times, and the ability to conduct “what-if” studies.

In the early phases of design, measured data is generally not available and is not required by SEAM. However, as the design progresses, the SEAM prediction accuracy may be improved by merging measured component test data into the model. During design, SEAM is best used to predict changes in noise and/or vibration for different design modifications. For example, the change in automobile cabin noise due to an increase in the size of the sun roof can be predicted using a SEAM model in a few hours. Changes in noise due to weight reductions of trim packages can also be easily predicted using SEAM.

APA: Which defects or challenges can be predicted by using SEAM and how can it help solve these issues?

Patricia: Using most current dynamic analysis software a numerical model must be defined. Design studies require that the model be changed – and that is often not a simple task. SEAM allows the use of

symbolic models. Symbols for important parameters may be defined so that changing to a new model is simply a matter of changing the values of the symbols. The SEAM model may then be automatically updated to a new configuration in hours instead of days.

APA: Which new or emerging industries have the opportunity to benefit from using SEAM for projects?

Patricia: Currently, SEAM is used by large OEMs and major suppliers. By making SEAM available through the Altair Partners program, we hope that a broader range of suppliers and manufacturers will find SEAM useful for their product design.

APA: What industries should be using SEAM already?

Patricia: SEAM models are being used in the automotive and truck vehicle industries, in the naval industry, in the aircraft industry, and in the heavy equipment industry.

APA: What are the major (essential) inputs required from the user?

Patricia: The requirements for SEAM are quite different than those for Finite Element Modeling (FEM). Geometry is not all that important in dealing with vibration and acoustics at high frequencies. This can come as a surprise to engineers familiar with FE modeling, where it is very important to define the exact geometry. At high frequencies, where SEAM is most useful, parameters such as damping and coupling factors are more important.

To learn more, check out the SEAM collateral on the APA website.

APA: What other (optional) inputs are required from the user?

Patricia: SEAM is based on the idea of a power balance between connected subsystems. The most important variable is the power input to the model. Any improvement in the accuracy of the power input in each frequency band will improve the prediction accuracy. Damping is important in determining the dissipation of energy within the system. Thus, improvements in the damping estimate from measured data will improve the accuracy of the SEAM prediction.

APA: How much time is required to learn and start using SEAM?

Patricia: An engineer with experience in high frequency acoustics and vibration can learn SEAM and develop a simple model in under one week.

APA: What's next for SEAM…what can we look forward to?

Patricia: Modules for sound package design, automatic meshing of SEA subsystems, hybrid models combining SEA and FEA models.